

Main freshwater viral diseases

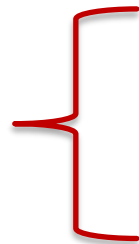
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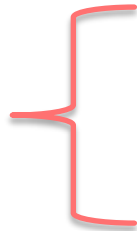
SUMMARY



✓ VHS
✓ IHN

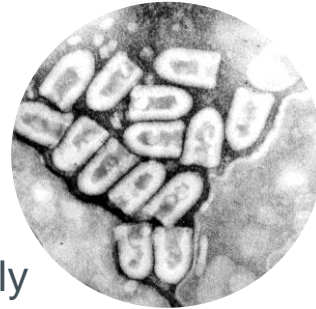


✓ KHV
✓ CEV



✓ AcIV
✓ AcHV

VIRAL HAEMORRAGIC SEPTICAEMIA (VHS) & INFECTIOUS HAEMATOPOIETIC NECROSIS (IHN)

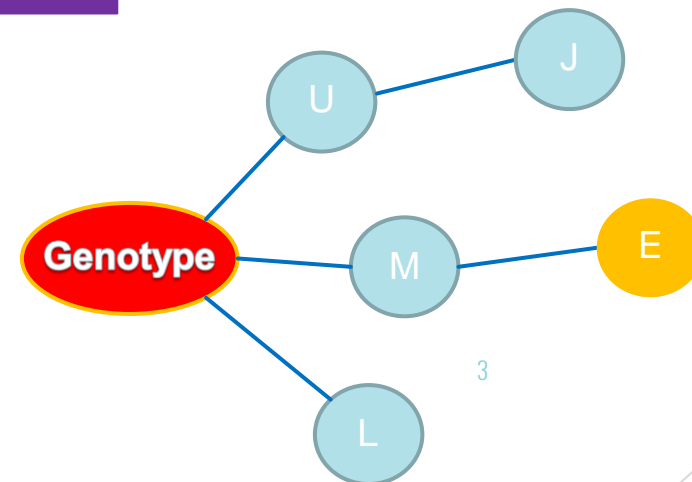
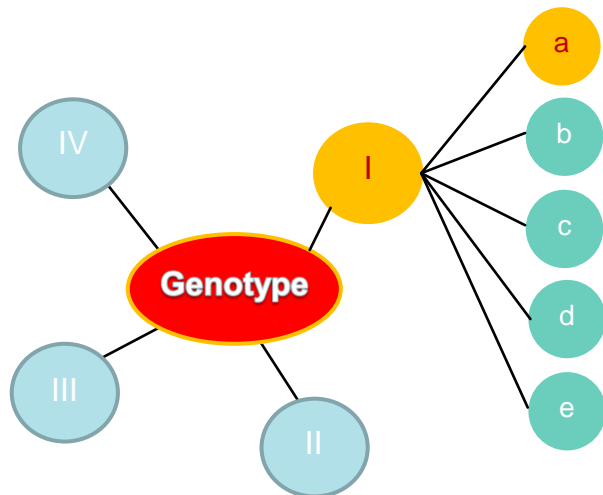


❖ VHS

- ▶ *Novirhabdovirus* within Rhabdoviridae family
- ▶ Enveloped
- ▶ 70x180 nm
- ▶ ssRNA negative sense (11-12 kbp)

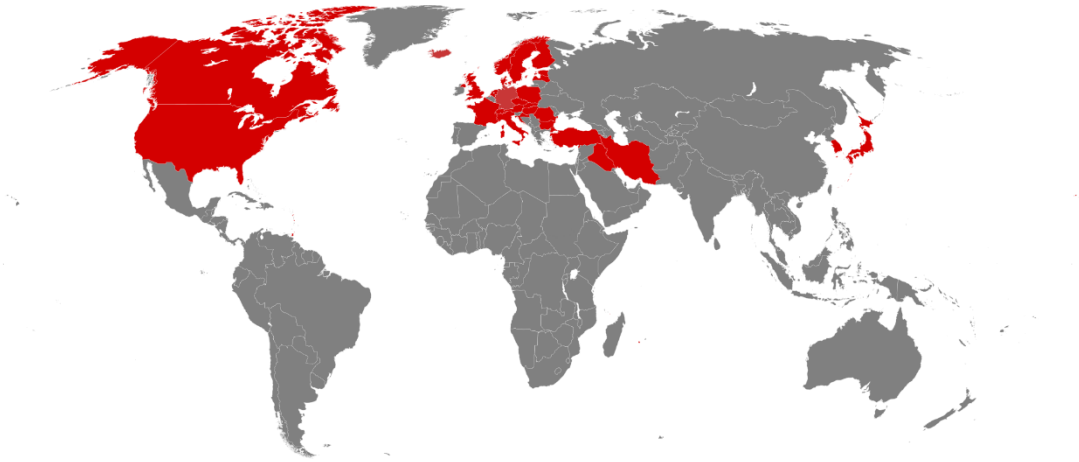
❖ IHN

- ▶ *Salmonivirus* within Rhabdoviridae family
- ▶ Enveloped
- ▶ 65-75x150-190 nm
- ▶ ssRNA negative sense (11-12 kbp)



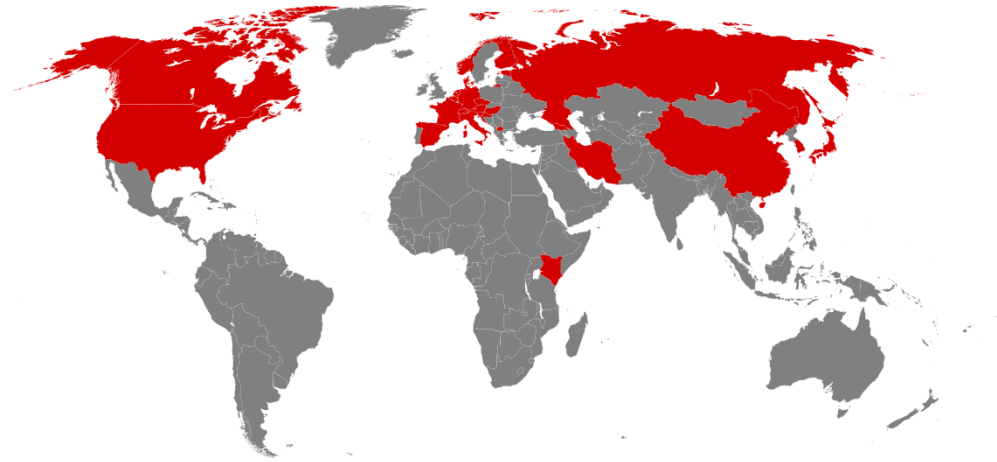
VIRAL HAEMORRAGIC SEPTICAEMIA (VHS) & INFECTIOUS HAEMATOPOIETIC NECROSIS (IHN)

❖ VHS



- ▶ Listed disease according to EU 2016/429 regulation and WOAH notifiable disease
- ▶ Infect more than 80 fish species (both freshwater and saltwater)
- ▶ *Oncorhynchus mykiss* is the target species

❖ IHN



- ▶ Listed disease according to EU 2016/429 regulation and WOAH notifiable disease
- ▶ Infect mainly salmonids and northern pike (*Esox lucius*)
- ▶ *Oncorhynchus mykiss* is the target species

CLINICAL SIGNS

- ❖ Lethargy
- ❖ Anorexia
- ❖ Abnormal swimming
- ❖ Darkening
- ❖ Gathering at the water outlet
- ❖ High mortality (juveniles are more susceptible)



- Size effect on IHN progression
- Except that in small juveniles, IHN cause generally a prolonged mortality



= 4-14°C



For IHN, field and experimental evidences suggest that disease can occur at higher water temperature (close to 20°C)

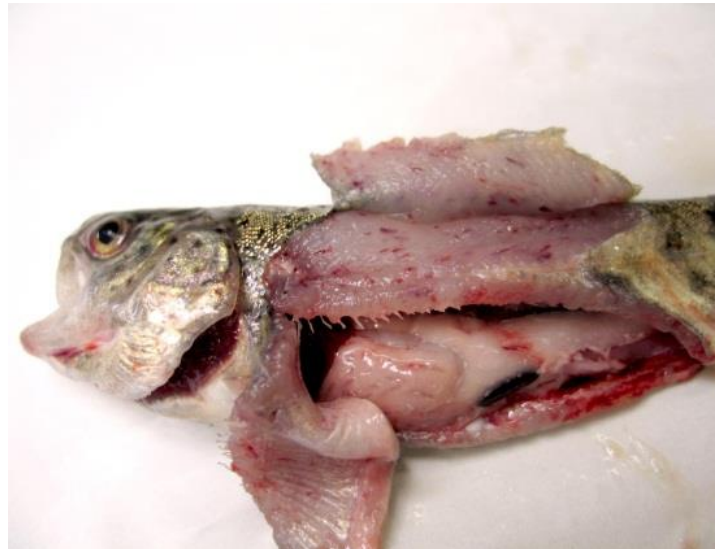


GROSS PATHOLOGY

❖ 2 different anatomopathological pictures



- Pale gills and internal organs
- Splenomegaly



- Ifema
- Petechiae in the muscles, visceral fat tissue, liver, heart and swim bladder
- Splenomegaly

❖ Some mixing of features may occur



- ❖ IHN can cause skeletal deformities in surviving juveniles

KOI HERPESVIRUS (KHV) & CARP EDEMA VIRUS (CEV)

❖ KHV

- ▶ Also known as CyHV-3
- ▶ dsDNA virus belonging to *Alloherpesviridae*
- ▶ Enveloped icosahedral virus with 115-130 nm capsid
- ▶ **Notifiable according to WOAHP legislation**
- ▶ Infect only *Cyprinus carpio* species
- ▶ Many asymptomatic vector species (crucian carp, grass carp, silver carp, bighead carp, tench)
- ▶ World wide distribution
- ▶ Except larvae, all life stages are susceptibles



= 16-28°C

❖ CEV

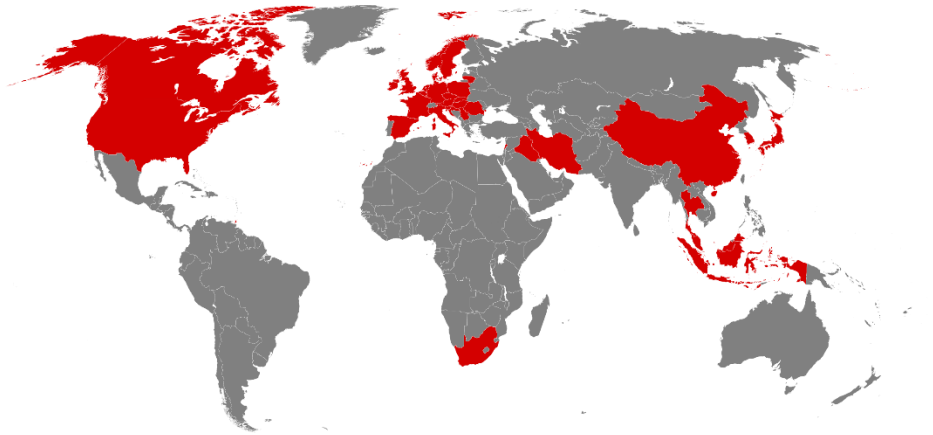
- ▶ Also known as **koi sleepy disease (KSD)**
- ▶ Caused by a poxvirus, enveloped DNA virus, 300-400 X 250-400 nm
- ▶ Infect only *Cyprinus carpio* species
- ▶ Bleak, crucian carp, european perch, prussian carp, roach and tench can be vectors
- ▶ Mortality ranging from 10-80% depending on water temperature



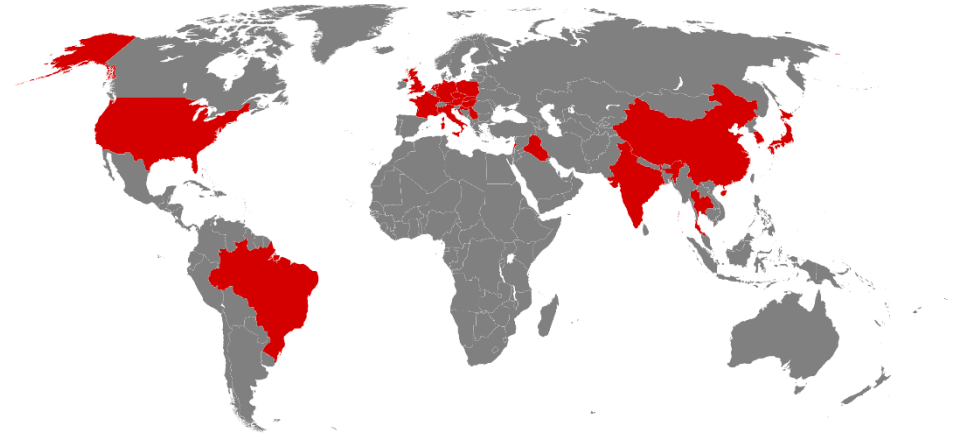
= 10-25°C

KOI HERPESVIRUS (KHV) & CARP EDEMA VIRUS (CEV)

❖ KHV



❖ CEV



Literature reports



CLINICAL SIGNS

- ❖ Lethargy
- ❖ Anorexia
- ❖ Abnormal swimming
- ❖ Dyspnea /gasp
- ❖ Gathering at water inlet/aeration device
- ❖ Excessive mucous production on skin and gills
- ❖ High mortality



2018 KHVD outbreaks in Iraq caused the loss of more than 2 millions common carp



In common carp, adult fish can be severely affected by CEV!



340 adult common carp (weight range= 3-18 kgs) died following a CEV outbreak in Italy in 2020

GROSS PHATOLGY



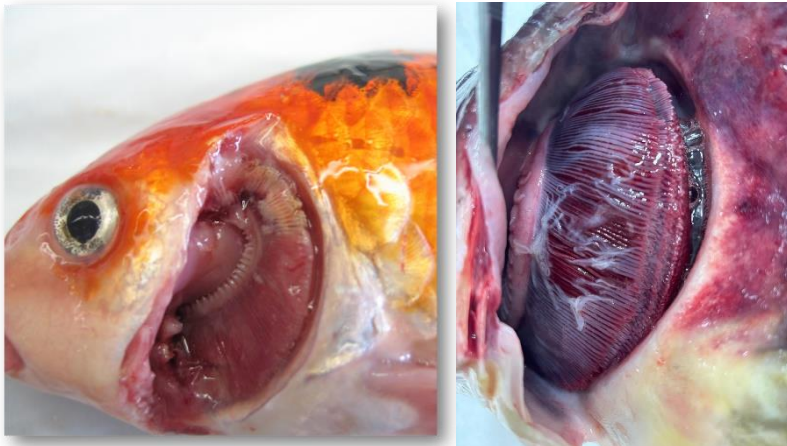
❖ Enophthalmus (sunken eye)



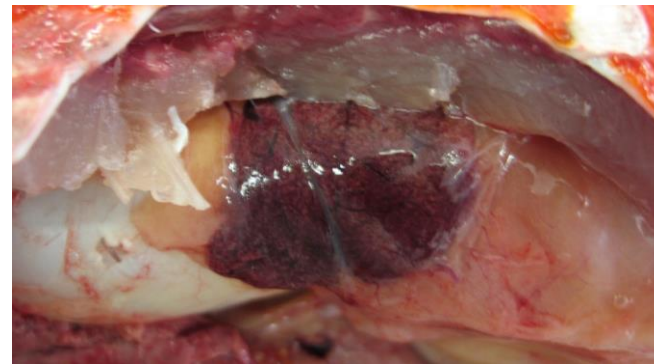
❖ Skin & fin haemorrhages



❖ Skin hypermucosity



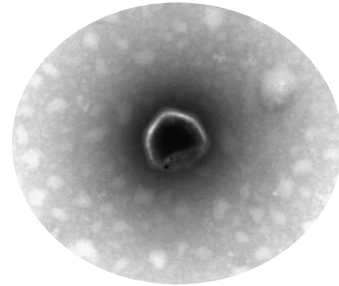
❖ Gill necrosis & ipermucosity



❖ Hyperemia and inflammation of internal organs

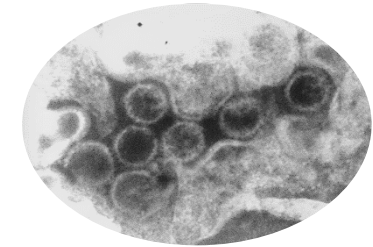
ACIPENSER IRIDOVIRUS (AcIV) & ACIPENSER HERPESVIRUS (AcHV)

❖ AcIV



- *Mimivirus* (formerly classified as Iridovirus)
- Considered very resistant in the environment
- World wide spread (names changes according to the lineage and the affected sturgeon species)
- Infecting all *Acipenser spp.* but Russian sturgeon appears the most susceptible species
- Survivors remain positive for long period (1 year)

❖ AcHV



- *Alloherpesvirus*
- AcHV-1 and AcHV-2 + variants
- Described mainly in *A. transmontanus* (AcHV-1), *A. baeri* (AcHV-2), hybrids
- Survivors remain carrier lifelong

Scarce informations for both diseases

ACIPENSER IRIDOVIRUS (AcIV) & ACIPENSER HERPESVIRUS (AcHV)

- Discolourations
- Hypermucosity
- Abnormal swimming
- Gill petechiae
- High mortality

- Skin erosions
- Skin hemorrhages
- Internal hemorrhages
- Prolonged low level mortality



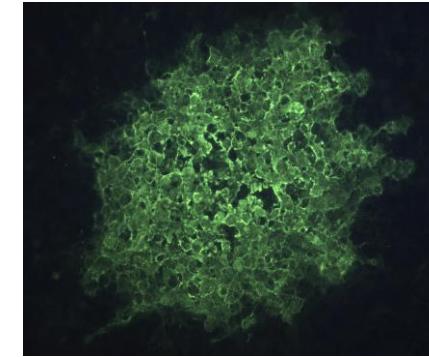
ACIPENSER IRIDOVIRUS (AcIV) & ACIPENSER HERPESVIRUS (AcHV)



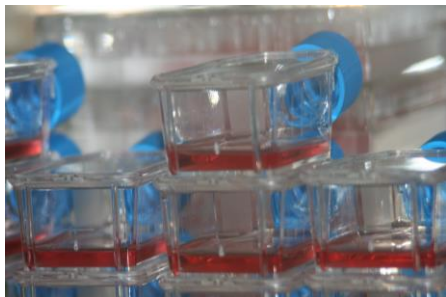
- Not listed diseases
- No surveillance plan
- No official data, only literature reports



DIAGNOSIS



	VHS	IHN	KHV	CEV	AcIV	AcHV
Target organs	Pool of internal organs	Pool of internal organs	Gills Brain Kidney	Gills Brain Kidney	Gills Brain	Gills Brain
Isolation on cell culture	EPC/BF2	EPC/BF2	CCB	N/A	N/A	WSSK
Molecular methods	Rt-qPCR, RT-PCR	Rt-qPCR, RT-PCR	qPCR, PCR	qPCR, PCR	qPCR, PCR	qPCR, PCR



For WOAHP notifiable diseases, refer to the Manual of Diagnostic Tests for Aquatic Animals

CONTROL

- ▶ No therapy for viral diseases
- ▶ Stamping out
- ▶ Use of free broodstock/ juveniles/ eggs
- ▶ High biosecurity standards and prevention measure
- ▶ Few vaccines available (DNA vaccine for IHN in Canada and live attenuated vaccine for KHV)



TAKE HOME MESSAGES

- ▶ Every farmed finfish species can be susceptible to different viral species, each one with specific epidemiological and diagnostic features
- ▶ Scarce informations for some viral diseases (AciV and AcHV)
- ▶ Control of viral diseases can be challenging and few prevention and mitigation tools are available
- ▶ Laboratories are essential for proper and effective diagnosis of viral diseases
- ▶ Majority of surveillance plan are targeting WOAHP listed diseases but what about others?

Thank you for your attention



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